

**REMARKS**

Claims 1-2, 4-12, 14, 17, 18, and 29, 30 are pending in the present application.

Reconsideration and allowance of the pending claims is respectfully requested.

**I. 35 U.S.C § 112**

The Examiner has rejected Claims 1, 2, 4-12, 14, 17, 18 and 29-30 under 35 U.S.C. § 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. This rejection is respectfully traversed.

In response, Applicant refers the Examiner to the telephone interview which took place on January 8, 2003. In that interview, it was agreed that Applicant never withdrew Figure 6B from consideration, and that Figure 6B shows the required elements from the pending claims. In particular, Examiner rejected independent Claims 1, 14, and 29 for failure to show the claimed limitation of a "through hole" in Figure 6C. However, since Figure 6B was not withdrawn, and since Figure 6B shows the "through hole," it is believed that the rejection under 35 USC §112 has been overcome.

**II. 35 U.S.C. § 103, Obviousness**

The Examiner has rejected claims 1, 4-9, 11-12, and 29 under 35 U.S.C. § 103 (a) as being unpatentable over Prior Art (PA, submitted by applicant) in view of Schneider et al. (U.S. Patent No. 4,362,904). The foregoing rejections are respectfully traversed for the reasons discussed below.

With regard to claims 1, 4-9, 11-12, and 29, the Office Action states:

As best understood to claims 1, 4-6, 8, 29 (based on the Figure 6C of this application), PA discloses a power module (100) and a method as shown in figures 1-4 comprising:

a FR4 board (110) formed from a plurality of layers (claims 4-6) having at least one element, which is a pair of planar magnetic cores (130, claim 8), mounted thereon; and at least one or three interconnects (solder balls 240-figure 4) for electrically coupling the element to an end user's circuit card (10-figure 4 ).

PA does not teach the interconnects having U-shaped including a sidewall and a contact surface, the contact surface includes a through hole, the through hole adapted to allow solder paste to flow into the interconnects to form a strong physical bond between the element and the end user's circuit card.

Schneider shows a interconnect (10) being formed U-shaped having a sidewall (22; 24) and a contact surface (20), the contact surface includes a through hole (26; 28) at side-edges of the contact surface.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use a structure of the interconnect having a U-shape as taught by Schneider to employ the power module and method of PA in order to provide a table against vibrating or other undesired movement of one board mounted to another board.

The Examiner uses the Schneider reference to reject independent Claims 1, 14, and 29. Claim 1 is reproduced for discussion:

1. (ONCE AMENDED) A power module comprising:
  - (a) a board having at least one element mounted thereon; and
  - (b) at least one interconnect for electrically coupling the element to an end user's circuit card, wherein the interconnect is U-shaped, the interconnect further comprising a contact surface having a through hole, said through hole adapted to allow solder paste to flow into the interconnect to form a strong physical bond between the element and the end user's circuit card.

Claim 1 as well as the other independent claims claim an "interconnect" in some way, which is used to electrically couple an electrical element to a circuit card, for

example. The Examiner points to Schneider element 10, characterizing this part as an "interconnect." However, Schneider clearly states that element 10 is a mounting support or spacer and is not an electrical interconnect. For example, Schneider states at col. 4 lines 13-15:

Support/spacer 10 may be constructed from any one of a number of known nonconductive flexible materials.

An electrical interconnect cannot be made from nonconductive materials. Hence, it is respectfully asserted that Schneider's support element 10 is not an "interconnect for electrically coupling..." as claimed in at least Claims 1, 14, and 29.

The Examiner also characterizes support element 10 of Schneider as being "U-shaped." However, Schneider's support element is actually not U-shaped, but has four "feet" on its base, making the element more H-shaped than U-shaped. In Claim 1 of Schneider, lines 32-33, Schneider specifically calls out the "four essentially rectangular feet" of element 10.

Having feet on the spacer 10 of Schneider creates several performance differences between Schneider's element 10 and the electrical interconnect of the present application. For example, the U-shaped pin design of the present electrical interconnect maximizes contact area, as the entire bottom of the interconnect structure makes contact with the circuit board, for example. Schneider's support element 10 only makes contact (and not electrical contact) on the bottom surfaces of the four feet--a significantly smaller surface area.

The U-shape design with through hole of the present interconnect element also enhances solderability. The through hole provides a path for solder to wick through and for the solder to outgas during a reflow process. On the H-shaped device of Schneider, the hole or slots would be elevated off the board surface (because of the four feet) and would not serve this purpose.

Furthermore, it is asserted that Schneider does not show the claimed limitation, "the interconnect further comprising a contact surface having a through hole," as claimed

in at least Claim 1. Schneider shows slots through the bottom surface of the spacer element 10, and not through holes.

On page 3 of the Office Action dated 10.18.02, the Examiner rejects Claim 29 for the same reasons as Claim 1. However, Claims 1 and 29 have different limitations, and it is respectfully asserted that the reasoning for rejecting Claim 1 is not adequate to reject Claim 29. Claim 29 follows:

29. A method of coupling a power module to an end-user circuit board comprising the steps of:
- (a) applying a solder paste to at least three mounting pads on said circuit board;
  - (b) placing a power module having at least three interconnects onto the circuit board so that the interconnects contact to solder paste; wherein the solder paste flows through holes in the interconnects; and wherein a tolerance between the interconnects is absorbed in the solder paste; and
  - (c) heating the solder paste.

This claim includes limitations not recited in Claim 1, such as the steps of “applying a solder paste to at least three mounting pads on said circuit board;” “wherein the solder paste flows through holes in the interconnects;” and “wherein a tolerance between the interconnects is absorbed in the solder paste.” Since these features of Claim 29 are not present in Claim 1 or in the cited references, it is respectfully believed that the rejection of Claim 29 fails to make out a *prima facie* case of obviousness.

On page 5 of the Office Action dated 10.18.02, Examiner states,

Regarding claims 2, 14, and 17, PA and Schneider disclose all of the limitations of the claimed invention, except for an interconnect made by conductive material.

Hayashi shows an interconnect (4-see figures 1-3) made by conductive material (column 4, lines 51-67).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use a conductive interconnect as taught by Hayashi to

employ the interconnect of PA and Schneider in order to make electrical connection between boards.

It is respectfully asserted that the Schneider and Hayashi references are not properly combinable in this way. Schneider shows a nonconductive spacer-element, wherein the slots 26, 28 are designed to accept electrical leads for connecting an electrical element to a circuit board, as stated in col. 3, lines 41-47. Since Schneider specifically states a nonconductive material is to be used, this teaches away from the combination of Schneider and Hayashi proposed by the Examiner. Making the spacer element 10 of Schneider conductive would also destroy the intended purpose of Schneider, since if spacer 10 were made conductive, it would mean the circuit board and electrical component 8 of Schneider would be in electrical contact at locations that were intended to be insulated by the spacer element 10. Hence, the nonconductive nature of Schneider's spacer element 10 teaches away from the combination proposed by the Examiner. A *prima facie* case of obviousness cannot be properly based upon a prior art reference if the prior art reference requires some modification in order to be properly combined with another reference and such a modification destroys the intended purpose or function of the disclosed invention in the reference.

All claims are believed to be distinguished from the cited references. Favorable reconsideration of the claims is respectfully requested.

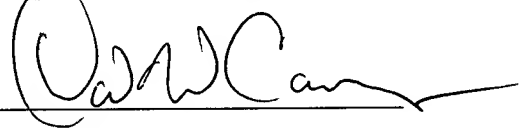
**III. Conclusion**

It is respectfully urged that the subject application is patentable over the cited references and is now in condition for allowance.

The examiner is invited to call the undersigned at the below-listed telephone number if in the opinion of the examiner such a telephone conference would expedite or aid the prosecution and examination of this application.

DATE: January 20, 2003

Respectfully submitted,

A handwritten signature in black ink, appearing to read "David W. Carstens", written over a horizontal line.

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